



July 10, 2000

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**SUBJECT: REVIEW OF KEITH W. EHLERT'S REPORT TITLED  
"FAULT AND SEISMIC INVESTIGATION FOR  
PROPOSED RESIDENTIAL DEVELOPMENT, TRACK 37-16  
MONO COUNTY, CALIFORNIA"  
DATED AUGUST 27, 1999**

Dear Gerry,

In accordance with your request dated May 9, 2000, a review has been completed of Mr. Keith W. Ehlert's letter, dated March 21, 2000, which presented his responses to questions raised during a peer review of the above subject report and presented in a letter dated January 23, 2000.

Mr. Ehlert provided responses to each of the eight questions raised during the peer review of his original report. In some cases the information he provided in his responses does help a reviewer better understand the basis for his conclusions. However, in many cases, it appears that he expected the reviewer to accept his conclusions based on his professional experience rather than by providing the documentation of the supporting data from which the reviewer could formulate a supporting or counter opinion. Based on the technical information provided, the following paragraphs provide comments on the remaining issues regarding the sites seismic hazard assessment.

### Surface Fault Rupture Hazard

In Item # 4 of his March 21, 2000 letter, Mr. Ehlert attributed the disrupted or anomalous patterns in clast orientations near station 150 in trench 3 and 4 to channeling or other depositional processes and he implied that the reliability of his conclusion is based on his past experience with other similar features. He stated that he "... performed very detailed logging of the trench walls" but he does not present any more detailed logs of these features to support his conclusions than what was provided in his August 27, 1999 report. One might argue that the feature seen at station 150 in the log of trench # 3, as presented in the August 27, 1999 report, is not fault related because, in that log, there is a suggestion that a stratigraphic layer may pass continuously (therefore un-faulted) below that anomaly and thus the anomaly would not be attributable to faulting. Unfortunately, the log is

not detailed enough, nor clear enough (since the log is cut at this point) to support his conclusion that the feature is depositional in origin. In regards to the anomaly at Station 150 in trench # 4, it appears, based on the log presented in the original August 27, 1999 report, that the trench was not deep enough to expose similar underlying stratigraphy. Mr. Ehlert stated that he observed both sides of the trench and found no faults but he did not present a log of the south side of the trench nor did he provide a more detailed log of either side of the trenches that might demonstrate that either of these two anomalies are depositional or channel features rather than fault related.

Several times in his March 21, 2000 letter, Mr. Ehlert stated that the site is not crossed by lineaments that could be the surface reflection of active faults. Although the aerial photos he referenced in his response have not been provided for peer review, a northwest trending lineament, expressed as a break-in-slope (that is a change from a flatter sloping ground surface on the southwest to a steeper sloping ground surface on the northeast) passes through the northeast portion of the property. This break in slope can be seen on the topographic map presented in Figure 1 of Mr. Ehlert's August 27, 1999 report. As seen in that figure, the break in slope extends both northwest and southeast of the site. It is also apparent on the site topographic map presented in Plate 1 of the same report, even through the poor copy provided for review. Most of all, this break in slope is apparent in the field.

It appears that Mr. Ehlert attempted to trench this break-in-slope. As quoted from page 5 of Mr. Ehlert's August 27, 1999 report "Trench 5 was excavated across a "break-in-slope". No faults were found in the trenches. The break-in-slope is attributed to alluvial processes." Based on the reviewer's field observations it appeared that trench 5 was placed on the southwest-facing riser of this northwest trending break-in-slope, but was not excavated far enough to the southwest to expose what lies beneath the surface at the break in slope or beneath the gentler slope to the southwest of the break in slope. Furthermore, based on its general trend, this break-in-slope could pass through the gap between trenches 3 and 4.

Therefore, the ground beneath the break-in-slope or to the southwest of the break-in-slope has not been exposed and thus the origin of the break-in-slope, whether it is depositional, a fault, or a fault line scarp, has not been resolved. It appeared that Mr. Ehlert attributed the "... breaks in slope in the site area..." to "... depositional features (i.e. the toe of an alluvial fan, etc.)." This can be a reasonable hypothesis, but the data supporting this hypothesis has not been provided in either the August 27, 1999 report nor in the responses provided in the March 21, 2000 letter.

Mr. Ehlert did not present any evidence as to the ages of the gravels exposed in the trenches. Nor did he address the ages of the alluvial surfaces that cross the site, which he concludes are un-faulted or do not have any suspicious lineaments that might be the surface expression of faults. Not resolving these age relationships is a significant weakness in an assessment of surface fault hazards at the site. It is difficult to make conclusions of the relative risk of surface fault rupture hazards, particularly at a site bordering a known active fault, without some measure of the age of the un-faulted gravels or the age of the geomorphic surfaces that Mr. Ehlert claimed show no lineaments



that might be indications of faults. The trenched gravels or the geomorphic surfaces might be too young to show evidence of displacements. Although the White Mountain Fault ruptured during the 1986 M 6.1 earthquake, the size of this earthquake was significantly smaller than the estimated future maximum 7.1 to 7.2 event attributable to this fault. The M 6.1, 1986 event was also at the lower end of the empirical record of earthquakes that produce surface ruptures. Therefore, the amount of surface rupture and possibly the distribution of surface rupturing slay and subsidiary faults were small in the 1986 event compared to what a future M 7.1 or 7.2 events might produce.

Mr. Ehlert stated in his March 21, 2000 letter, "It is important to recognize that the location of the fault in the site area is relatively well defined. It is located east of the property. This is not a situation where the location of the active fault is unknown. In other words, we know where the fault is." Although this statement is in part true, the question relative to the fault surface rupture hazard at the site is also whether or not other slays, branches, subsidiary or en echelon stepping traces of the fault, which did not rupture in the M 6.1 1986 event or were not recognized in the mapping that followed that event, could rupture in a future M 7.1 or 7.2 event and cross the site. As stated by Mr. Ehlert on page 6 of his August 27, 1999 report, "Surface faulting is rarely confined to a simple narrow line nor is it necessarily restricted to known or identified fault traces. During the San Fernando, Landers, and Northridge earthquakes, a relatively wide zone of fault breakage occurred where no faults had previously been recognized. The significance of this information with regard to the site is that it indicates that when an earthquake occurs, ground ruptures may not necessarily be confined to known fault traces, but rather could occur almost anywhere in the vicinity of the causative fault, including at locations where no known faults exist." Thus, the importance of obtaining the necessary data to resolve the surface rupture hazard issue at the site is recognized, but there appears to be some data gaps that remain to be filled.

### Ground Motions

In terms of the anticipated ground motions at the site, the procedure described by Mr. Ehlert seems to rely on dated references and relationships as well as a seemingly arbitrary scaling factor to develop the design peak ground acceleration for the site.

The current practice to estimate "instrumental" peak ground acceleration for a given site involves, as a minimum, the use of current empirical attenuation relationships (typically 1997 or later) appropriate for the site conditions and the style of the contributing fault as well as its design magnitude and a distance to the fault, consistent with each attenuation relationship. The first issue of the 1997 Seismological Research Letter contains numerous attenuation relationships consistent with the current practice. (Similar requirements apply to elastic spectral acceleration values. However, for them, in addition, the near-fault directivity effects should be reflected in the results for sites close to a significant fault)

The resulting peak ground acceleration values are "instrumental" values, which may not be appropriate for use in design of structures. Often the peak ground acceleration parameter used for

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design is the effective peak ground acceleration. Typically, a structural engineer would estimate the effective peak ground acceleration because its value depends on many variables not well known to professionals who estimate "instrumental" peak ground accelerations. The use of a fixed scaling factor, such as 0.065 without structural considerations is in general not desirable.

### Conclusions

Based on the information provided and a site reconnaissance, the following steps are recommended to resolve the seismic hazard issues at the subject site:

- The county should be provided with a copy of the stereo aerial photographs used by Mr. Ehler to formulate his conclusions regarding the lack of lineaments across the site or lineaments that trend toward the site from the southeast or the northwest.
- Trench 5 should be extended further to the southwest to resolve the origin of the break-in-slope that crosses the northeastern portion of the site.
- Trench the gap between trench 3 and 4 and deepen the exposure beneath the anomaly in the orientation of the clasts at station 150 in trench 4.
- The age of the various alluvial surfaces across the site and the gravels exposed in the trenches should be resolved. An analysis of the geomorphology and the soil horizon presented in the trench logs might provide at least a qualitative measure of the age of the unfaulted gravels exposed in the trenches across the majority of the site.
- It would seem that applying the seismic criteria in the Uniform Building would be a more defensible approach towards addressing ground motion estimates. Alternatively, an adequate value of peak ground acceleration for design purposes can also be obtained following FEMA273 with the USGS ground motion maps.

If you have any questions regarding the content of this letter please call.

Sincerely,

**GeoPentech**



S. Thomas Freeman  
Principal  
E.G. 1015



**GeoPentech**